

## 5-9 Complex Numbers

$$\sqrt{-1} = i$$

$$i^2 = -1$$

Simplify.

$$\begin{array}{cccc} \sqrt{-5} & \sqrt{-25} & \sqrt{50} & \sqrt{28} \\ i\sqrt{5} & 5i & i\sqrt{50} & 2i\sqrt{7} \\ & & 5i\sqrt{2} & \end{array}$$

$$\begin{array}{l} i^{17} \\ i \cdot i^{16} \\ i (i^2)^8 \\ i (-1)^8 \\ i \end{array}$$

$$\begin{array}{l} i^{46} \\ (i^2)^{23} \\ (-1)^{23} \\ -1 \end{array}$$

## Multiplication

$$\begin{array}{l} \text{ex:} \\ -3i \cdot 2i \\ -6i^2 \\ -6(-1) \\ 6 \end{array}$$

Must simplify 1st!

$$\begin{array}{l} \text{ex:} \\ \sqrt{-12} \cdot \sqrt{-2} \\ 2i\sqrt{3} \cdot i\sqrt{2} \\ 2i^2\sqrt{6} \\ -2\sqrt{6} \end{array}$$

$$\begin{array}{l} \text{ex:} \\ \sqrt{-4} \cdot \sqrt{-25} \\ 2i \cdot 5i \\ 10i^2 \\ -10 \end{array}$$

ex:

$$\sqrt{-3} \cdot \sqrt{-27}$$

Add and Subtract

ex:

$$\sqrt{-16} - \sqrt{-49}$$

$$4i - 7i$$

$$-3i$$

ex:

$$i\sqrt{2} + 3i\sqrt{2}$$

$$4i\sqrt{2}$$

Solve.

$$5y^2 + 20 = 0$$

$$5y^2 = -20 \rightarrow \sqrt{y^2} = \sqrt{-4}$$

$$\sqrt{y^2} = \sqrt{4}$$

$$y = \pm 2i$$

Cannot leave  $i$  in the denominator

$$\frac{2}{3i} \cdot \frac{i}{i} = \frac{2i}{-3}$$

ex:

$$\frac{6}{\sqrt{-2}} = \frac{6}{i\sqrt{2}} \cdot \frac{i\sqrt{2}}{i\sqrt{2}} = \frac{6i\sqrt{2}}{-2}$$

$$\frac{i^2}{-1 \cdot 2} = -3i\sqrt{2}$$

## Complex Numbers

 $a + bi$  where  $a, b \in \mathbb{R}$ ex:  $5 + 2i$ ex:  $3 - i$ 

Pure imaginary number

 $bi$  where  $b \neq 0$ ex:  $2i$ 

ex:

$$(3 + 6i) + (4 - 2i)$$

$$7 + 4i$$

ex:

$$(3 + 6i) - (4 - 2i)$$

ex:

$$(3 + 4i)(5 + 2i)$$

$$15 + 6i + 20i + 8i^2$$

$$-8$$

$$7 + 26i$$

ex:

$$\frac{(4 - 3i)}{(2 - 4i)} \frac{2 + 4i}{2 + 4i}$$

"Fun with Factoring"

$$x^2 + 8$$

Hw  
p274  
21-41 odd 44, 50, 56